Amendments to the Claims

This listing of claims will replace all prior versions, and listings of claims in the application.

Please cancel claims 19, 20 and 28 without prejudice to or disclaimer of the subject matter therein.

1. (currently amended) An injection molding apparatus, comprising:

a mold block ~~, a nozzle, a gating system, and a slug heater;~~

~~the mold block~~ defining a mold cavity having a mold cavity inlet,

[[the]] a nozzle having a nozzle inlet and defining a portion of a melt flow passage, wherein the nozzle inlet is fluidically ~~connectable~~ connected downstream from a melt source and ~~wherein the nozzle inlet is~~ upstream from the mold cavity inlet [[,]] and ~~wherein a~~ the melt flow passage extends from the nozzle inlet to the mold cavity inlet,

[[the]] a gating system including a valve pin and an actuator, wherein the actuator is operatively connected to the valve pin such that the valve pin is movable between an open position wherein melt flow is permitted into the mold cavity, and a closed position wherein the valve pin blocks the melt flow passage to prevent melt flow into the mold cavity ; ~~, wherein the actuator is operatively connected to the valve pin to move the valve pin between the open and closed positions,~~

~~and wherein~~ a cooling system included in at least one of the mold block and the valve pin ~~includes a cooling system~~ for selectively solidifying melt to form a slug immediately upstream from the valve pin when the valve pin is in the closed position, wherein~~, in use,~~ the slug blocks the melt flow passage to substantially prevent melt leakage past the slug when the valve pin is positioned away from the slug [[,]] ; and

~~and wherein the slug heater is thermally connectable to the slug and wherein the~~ a slug heater [[is]] configured for selectively melting the slug ~~sufficiently~~ to permit melt flow in the melt flow passage.

2. (original) An injection molding apparatus as claimed in claim 1, wherein the valve pin is positioned in the mold block.

3. (currently amended) An injection molding apparatus as claimed in claim 1, wherein the mold block includes a first mold plate and a second mold plate, and the mold block has a mold-closed position and an ejection position ~~and the first and second mold plates are positionable in a mold-closed position~~ wherein the first and second mold plates mate together to define the mold cavity in the mold-closed position[[,]] and ~~an ejection position wherein~~ the first and second mold plates are separated sufficiently for the ejection of a molded part from the mold cavity ~~, and wherein in the ejection position~~ and the valve pin is positioned away from the slug in the ejection position.

4. (original) An injection molding apparatus as claimed in claim 1, wherein the melt flow passage includes a slug formation portion, wherein at least a portion of the slug formation portion has a cross-sectional area that reduces in a downstream direction, and the valve pin is moveable to a position immediately downstream from the slug formation portion in the closed position, so that the slug is formed in the slug formation portion.

5. (original) An injection molding apparatus as claimed in claim 4, wherein the slug formation portion is generally frustoconical.

6. (currently amended) An injection molding apparatus as claimed in claim 4, wherein the ~~gate passage~~ mold cavity inlet further includes a valve pin sealing portion that is immediately downstream from the slug formation portion, wherein the valve pin sealing portion is configured to cooperate with the valve pin to seal against melt flow therebetween.

7. (original) An injection molding apparatus as claimed in claim 6, wherein the valve pin sealing portion is cylindrical.

8. (original) An injection molding apparatus as claimed in claim 1, wherein the nozzle defines a nozzle melt channel, and wherein the nozzle melt channel extends generally linearly through the nozzle.

9. (currently amended) An injection molding apparatus as claimed in claim 1, wherein ~~the nozzle includes a nozzle heater and wherein~~ the slug heater comprises [[the]] a nozzle heater.

10. (original) An injection molding apparatus as claimed in claim 9, wherein the nozzle has a nozzle body and the nozzle heater is attached to the nozzle body.

11. (currently amended) An injection molding apparatus as claimed in claim 10, wherein the nozzle defines a nozzle melt channel [[,]] and ~~wherein~~ the nozzle melt channel and the nozzle heater are [[both]] concentric about a common axis.

12. (currently amended) An injection molding apparatus as claimed in claim 1, ~~wherein the valve pin includes a valve pin heater,~~ wherein the slug heater ~~includes the~~ comprises a valve pin heater.

13. (currently amended) An injection molding apparatus as claimed in claim 1,

wherein the melt flow passage includes a slug formation portion ~~wherein, in use, the slug forms, and wherein the melt flow passage includes~~ and a slug release portion, wherein the slug release portion is located in the nozzle and has a cross-sectional area larger than the slug formation portion, and ~~wherein the slug release portion~~ the slug release portion is heated sufficiently to maintain melt therein in a liquid state ~~and wherein the cross-sectional area of the slug release portion larger than that of the slug formation portion~~, and

wherein the valve pin is further movable to a slug release position, ~~and wherein~~ such that movement of the valve pin from the closed position to the slug release position drives the slug from the slug formation portion ~~of the melt passage~~ to the slug release portion ~~of the melt flow passage~~.

14. (original) An injection molding apparatus as claimed in claim 1, wherein the valve pin includes a cooling system to selectively cool and solidify melt immediately upstream therefrom to facilitate formation of the slug.

15. (currently amended) An injection molding apparatus as claimed in claim 14, wherein the valve pin includes a valve pin body and wherein at least a portion of the valve pin body is hollow and is ~~connectable~~ configured to be connected to a source of coolant fluid for circulating coolant fluid through the valve pin body.

16. (currently amended) An injection molding apparatus as claimed in claim 15, ~~wherein the valve pin includes a valve pin body and~~ wherein at least a portion of the valve pin body is configured to be connected ~~hollow and is connectable~~ to a source of

heating fluid for circulating heating fluid through the valve pin body to selectively heat the valve pin ~~, thereby forming a valve pin heater, and wherein said slug heater includes the valve pin heater~~.

17. (currently amended) An injection molding apparatus as claimed in claim 1, wherein the mold block includes a plurality of mold cavities and the melt flow passage is in fluid communication with the plurality of mold cavities and ~~wherein~~ , in the closed position, the valve pin blocks a portion of the melt flow passage upstream from [[all of]] the mold cavities.

18. (currently amended) A method for controlling melt flow in an injection molding apparatus, the injection molding apparatus including a mold block ~~, a manifold, and at least one nozzle, the mold block~~ defining a mold cavity having a gate passage thereto, a manifold and [[the]] at least one nozzle defining a nozzle melt channel for transferring melt from a melt source to the gate passage, the method comprising:

providing ~~at the gate passage,~~ a valve pin at the gate passage that is ~~moveable between~~ in an open position ~~wherein~~ such that the valve pin is at least partially removed from the gate passage; ~~, to a closed position wherein the valve pin cooperates with the gate passage to inhibit melt flow therebetween, wherein the valve pin is positioned outside the nozzle melt channel in both the open and closed positions and is positioned away from the mold cavity in both the open and closed positions; and~~

moving the valve pin to a ~~between the open~~ closed position ~~and the closed position to control the flow of melt into the mold cavity;~~

solidifying melt immediately upstream of the valve pin to form a slug to create a seal between the melt source and the gate passage; and

moving the valve pin back to the open position after forming the seal between the melt source and the gate passage.

19. (canceled)

20. (canceled)

21. (currently amended) A method as claimed in claim 18 [[19]], wherein the mold block includes a first mold plate and a second mold plate, and the first and second mold plates together define the mold cavity, and the method further comprises the steps of:

positioning the first and second mold plates in an ejection position after forming the seal between the [[slug]] melt source and the gate passage, wherein in the ejection position the first and second mold plates are separated sufficiently for the ejection of the molded part from the mold cavity ~~, and wherein in the ejection position, the valve pin is removed from the gate passage~~; and

ejecting the molded part from the mold cavity ~~when the first and second mold plates are in the ejection position~~.

22. (currently amended) A method as claimed in claim 21, further comprising the steps of:

positioning the first and second mold plates in a mold-closed position after ejecting the molded part from the mold cavity, wherein in the mold-closed position the first and second mold plates mate together to define the mold cavity; and

heating the slug to liquefy the slug sufficiently to permit melt to flow into the gate passage and into the mold cavity.

23. (currently amended) A method as claimed in claim 21 [[22]], further comprising:

positioning the first and second mold plates in a mold-closed position after ejecting the molded part from the mold cavity, wherein in the mold-closed position the first and second mold plates mate together to define the mold cavity;

moving the valve pin to drive the slug out of the gate passage; and ~~after moving the first and second mold plates to the mold-closed position and prior to completion of the heating step~~

heating the slug to liquify the slug sufficiently to permit melt to flow into the gate passage and into the mold cavity.

24. (original) A method as claimed in claim 18, wherein the mold block includes a plurality of mold cavities and a plurality of gate passages thereto, and wherein the plurality of gate passages are in fluid communication with the nozzle melt channel via a common inlet portion, and wherein in the closed position the valve pin cooperates with the common inlet portion to prevent melt flow into the plurality of mold cavities.

25. (currently amended) An injection molding apparatus, comprising:

a mold block~~, at least one nozzle and at least one gating system, the mold block~~ defining a mold cavity having a gate passage thereto; [[,]] [[the]]

at least one nozzle defining a nozzle melt channel, wherein the nozzle is ~~positionable~~ positioned so that the nozzle melt channel is downstream from a melt source and [[is]] upstream from the gate passage; and [[,]] [[the]]

at least one gating system including a valve pin positioned in the mold block and an actuator, wherein the actuator is operatively connected to the valve pin such that the valve pin is movable in the nozzle melt channel between an open position wherein the valve pin is at least partially removed from the gate passage to permit melt flow into the mold cavity [[,]] and a closed position wherein the valve pin cooperates with the gate passage to prevent melt flow into the mold cavity;

~~wherein the actuator is operatively connected to the valve pin to move the valve pin between the open and closed positions;~~

wherein the valve pin is positioned outside of the nozzle melt channel in both the open and closed positions~~, wherein the valve pin is positioned in the mold block, and wherein the valve pin is generally opposed to and is movable co-axially with the nozzle melt channel~~, and

wherein at least one of the nozzle, the mold block and the valve pin is adapted to solidify melt immediately upstream from the valve pin to form a slug when the valve pin is in the closed position.

26. (original) An injection molding apparatus as claimed in claim 25, wherein the mold block includes a plurality of mold cavities and a plurality of gate passages thereto, and wherein the plurality of gate passages are in fluid communication with the nozzle melt channel via a common inlet portion, and wherein in the closed position the valve pin cooperates with the common inlet portion to prevent melt flow into the plurality of mold cavities.

27. (original) An injection molding apparatus as claimed in claim 25, wherein the melt flow is a metal.

28. (canceled)

29. (currently amended) An injection molding apparatus, comprising:

a mold block ~~, a nozzle and a gating system,the mold block~~ defining a plurality of mold cavities and a plurality of gate passages thereto, wherein the plurality of gate passages are in fluid communication with a common inlet portion; [[,]]

[[the]] a nozzle defining a nozzle melt channel, wherein the nozzle is ~~positionable~~ positioned so that the nozzle melt channel is downstream from a melt source and [[is]] upstream from the common inlet portion; [[,]]

[[the]] a gating system including a valve pin and an actuator, wherein the actuator is operatively connected to the valve pin such that the valve pin is movable between an open position wherein the valve pin is at least partially removed from the common inlet portion to permit melt flow into the plurality of mold cavities, and a closed position wherein the valve pin cooperates with the common inlet portion to ~~prevent~~ inhibit melt flow into the plurality of mold cavities, and wherein the valve pin is positioned outside of the nozzle melt channel in both the open and closed positions~~, and wherein the actuator is operatively connected to the valve pin to move the valve pin between the open and closed positions~~;

a cooling system included in the valve pin; and

a slug heater included in the nozzle.